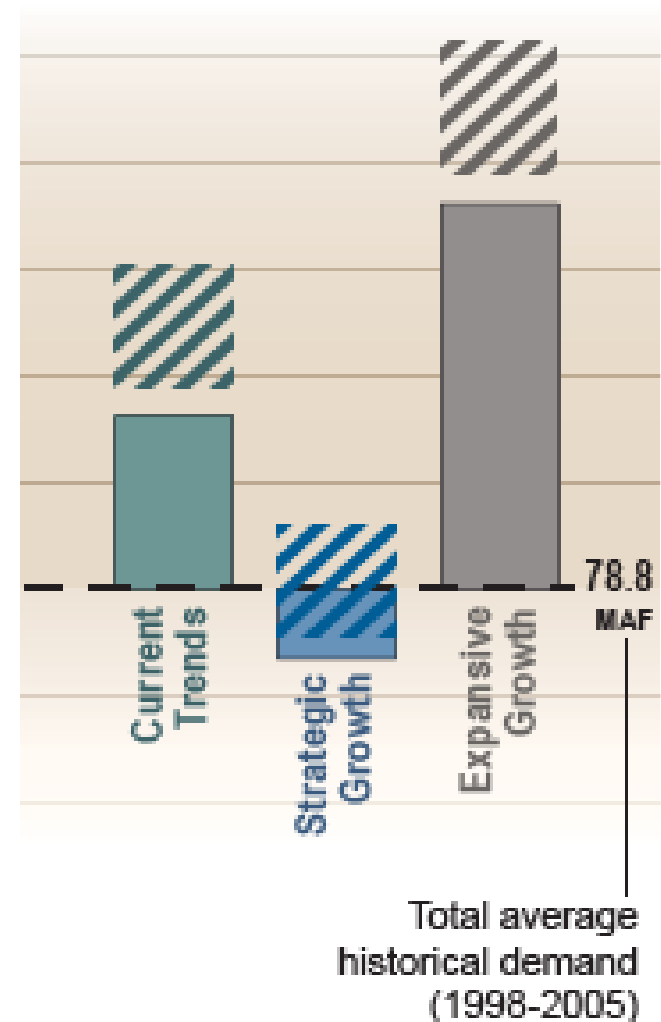


Scenario Analysis for Update 2013

Combined Water Demand
Change by Scenario



Presentation Overview

- 💧 Vision for Water Plan Technical Analysis
- 💧 Application of Scenarios to Update 2009
- 💧 Proposal to Evaluate Resource Management Strategies for Update 2013



Vision & Purpose

for Analytical Tool and Data Improvements

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 Support decision making in light of uncertainties
 - Promote collaborative decision making, Shared Vision Planning
- 💧 Support integrated water management regionally and statewide
 - Supply reliability, flood management, environmental restoration, water quality, economic efficiency, social equity



Water Plan

Quantitative Deliverables

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 Accurately describe recent water management conditions (Water Portfolios)
- 💧 Develop multiple baseline future conditions (Scenarios)
- 💧 Identify alternative water management response packages (management strategies)
- 💧 Evaluate performance of strategies in terms of benefits, costs, and tradeoffs
- 💧 Evaluate interaction between local, regional, and statewide water management
- 💧 Support Water Planning Information Exchange



Water Plan Scenarios

Used To Consider Future Uncertainty

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

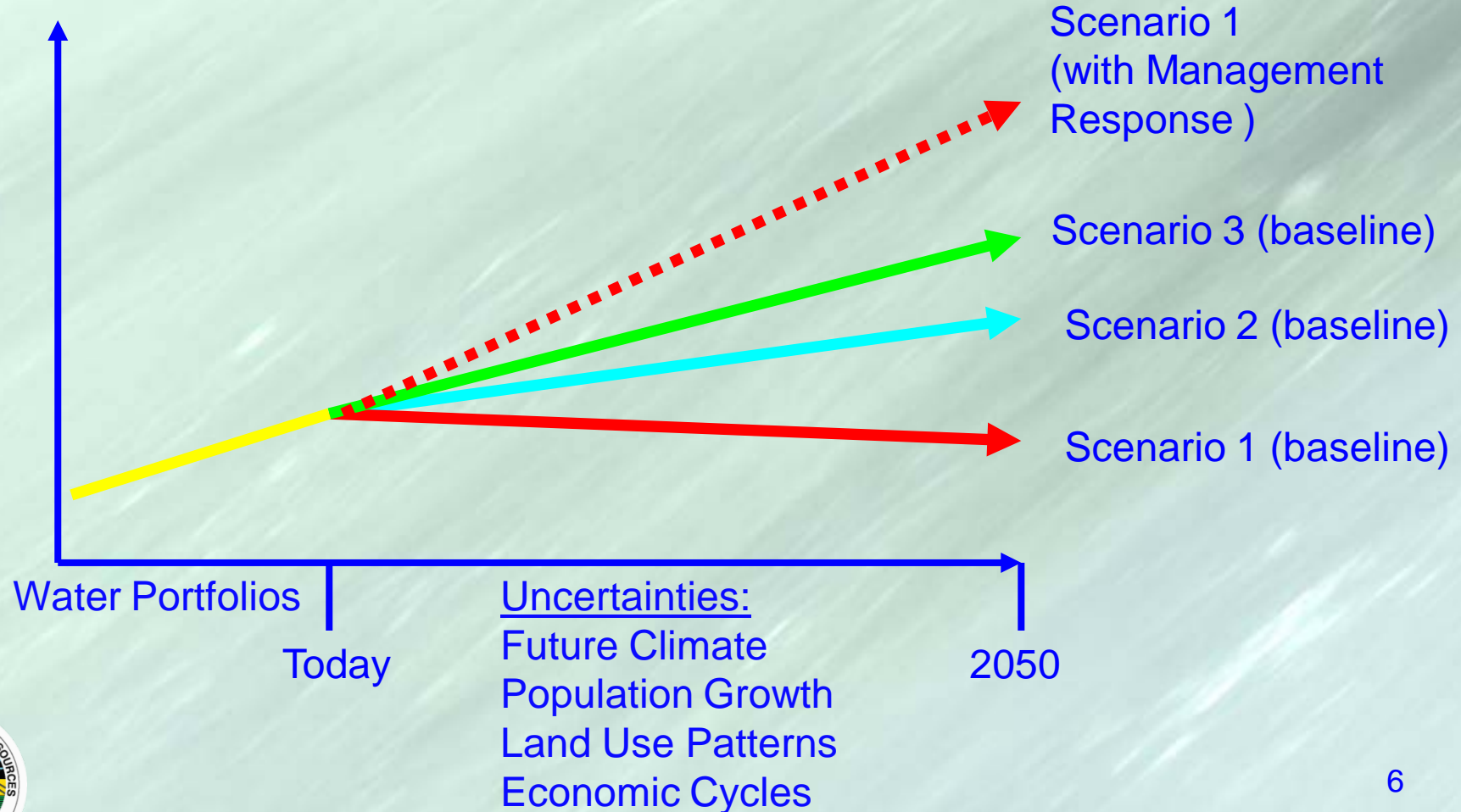
- 💧 Three plausible yet very different conditions during 2050 planning horizon
- 💧 Explore key uncertainties facing water community
- 💧 Factors water community has little control over
- 💧 Not predictions ---- used to evaluate water management responses



Scenarios and Water Management Responses

- Vision
- Update 2009
- Update 2013 proposal
















Indicators
(e.g. Supply Reliability)



CWP 2009 Demographic and Land Use Factors Drive Changes in Demand

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

Factors of Uncertainty

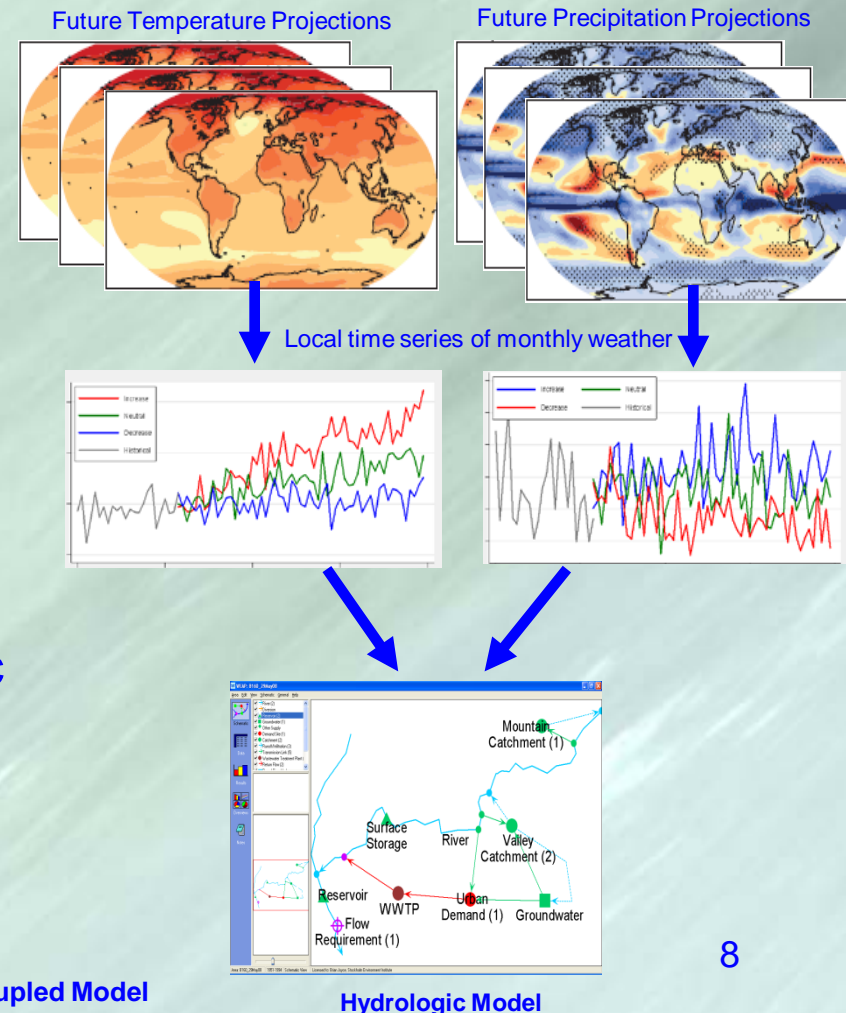
	Current Trends	Slow & Strategic Growth	Expansive Growth
Population	<p>Recent trends are assumed to continue into the future. Regulations are not coordinated or comprehensive, creating uncertainty for planners and managers. The state continues to face lawsuits, from flood damages to water quality and endangered species protections.</p>  <p>59.5 million* (22.8 million increase)</p>	<p>Private, public, and governmental institutions form alliances to provide for efficient planning and development that is less resources intensive than current conditions. State government implements comprehensive and coordinated regulatory programs to improve water quality, protect fish and wildlife, and protect communities from flooding.</p>  <p>44.2 million (7.5 million increase)</p>	<p>Future conditions are more resource intensive than existing conditions. Protection of water quality and endangered species is driven mostly by lawsuits. State government has responded on a case-by-case basis, creating a patchwork of regulations and uncertainty for planners and water managers.</p>  <p>69.8 million (33.1 million increase)</p>
Land Use	 <p>Continued development</p>	 <p>Compact development</p>	 <p>Sprawling development</p>
Irrigated Crop Area	 <p>8.6 million acres (0.7 mil. acre decrease)</p>	 <p>9.0 million acres (0.2 mil. acre decrease)</p>	 <p>8.2 million acres (1.0 mil. acre decrease)</p>
Environmental Water	 <p>1.0 additional MAF</p>	 <p>1.5 additional MAF</p>	 <p>0.6 additional MAF</p>
Background Water Conservation	 <p>10% more efficient</p>	 <p>15% more efficient</p>	 <p>5% more efficient</p>



Analysis Considers Possible Climate Change Impacts

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

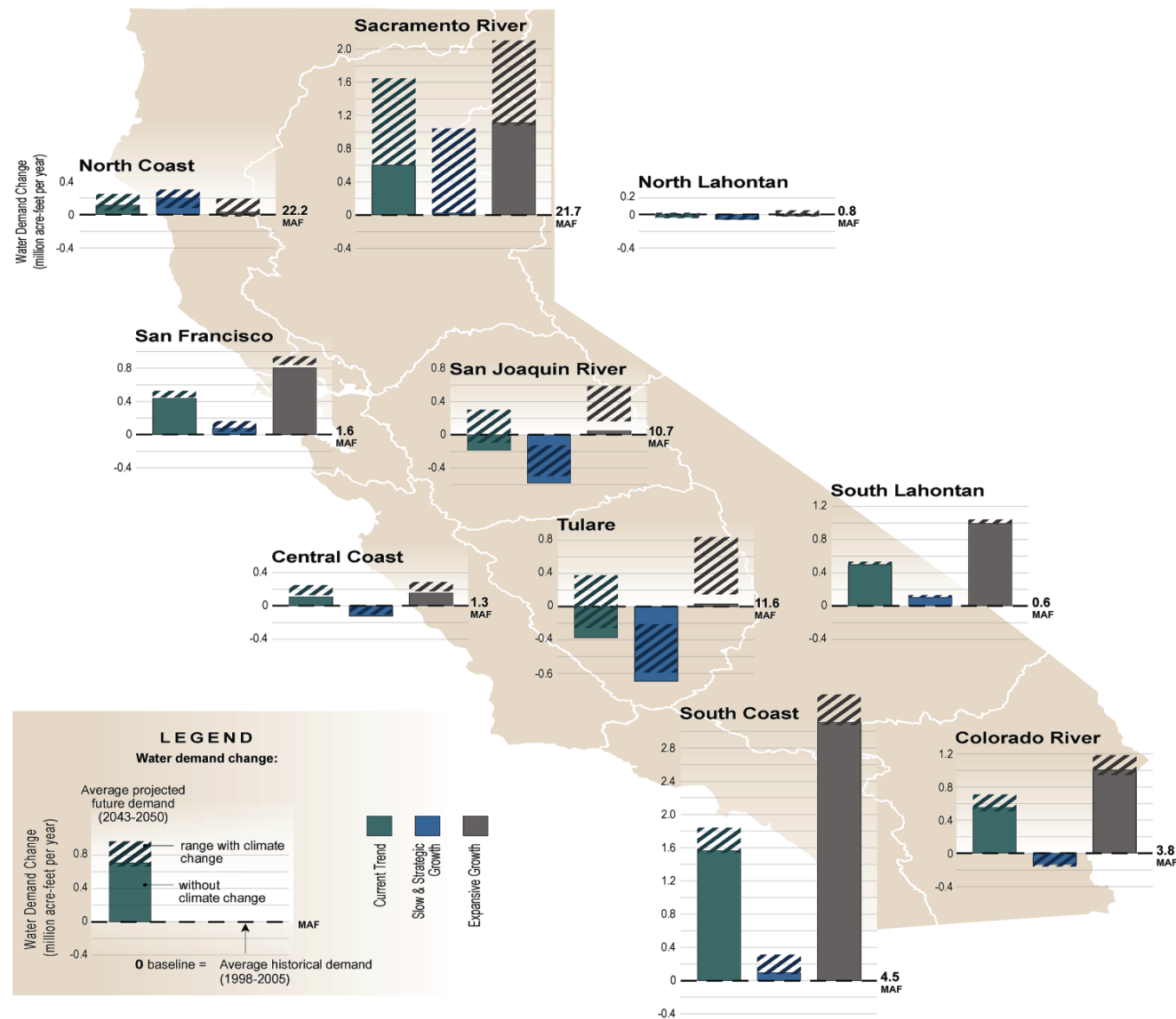
- **Global circulation models produce numerous projections of future temperature and precipitation patterns**
 - Six GCMs
 - Two global emissions scenarios
- **Statistical downscaling methods produce local weather sequences***
- **Weather sequences drive hydrologic models to calculate:**
 - irrigation demand (HR and PA)
 - hydrologic flows (PA analysis, only)



* Using the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset

Regional Water Demand Changes by Scenario

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal



Update 2013 Phased Approach

More detailed on Central Valley

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 Uses new WEAP model developed to support the 2013 California Water Plan
 - Developed by SEI w/support from DWR, MWH, and RAND
- 💧 Three hydrologic regions
- 💧 Mountain and valley floor
- 💧 Study period is 2005 to 2050
- 💧 Collaboration with USBR



Pilot Study Illustrates Application of Robust Decision Making (RDM) for Water Plan

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 RDM is an iterative, analytic approach that:
 - Considers *uncertainty* that is not easily characterized statistically
 - Future climate, land uses, environmental regulations
 - Systematically evaluates *options* to increase robustness of current strategies
 - Analysis guides development of new, adaptive strategies
 - Values outcomes across broad array of *metrics*
 - Accommodates wide range of objectives and values over outcomes

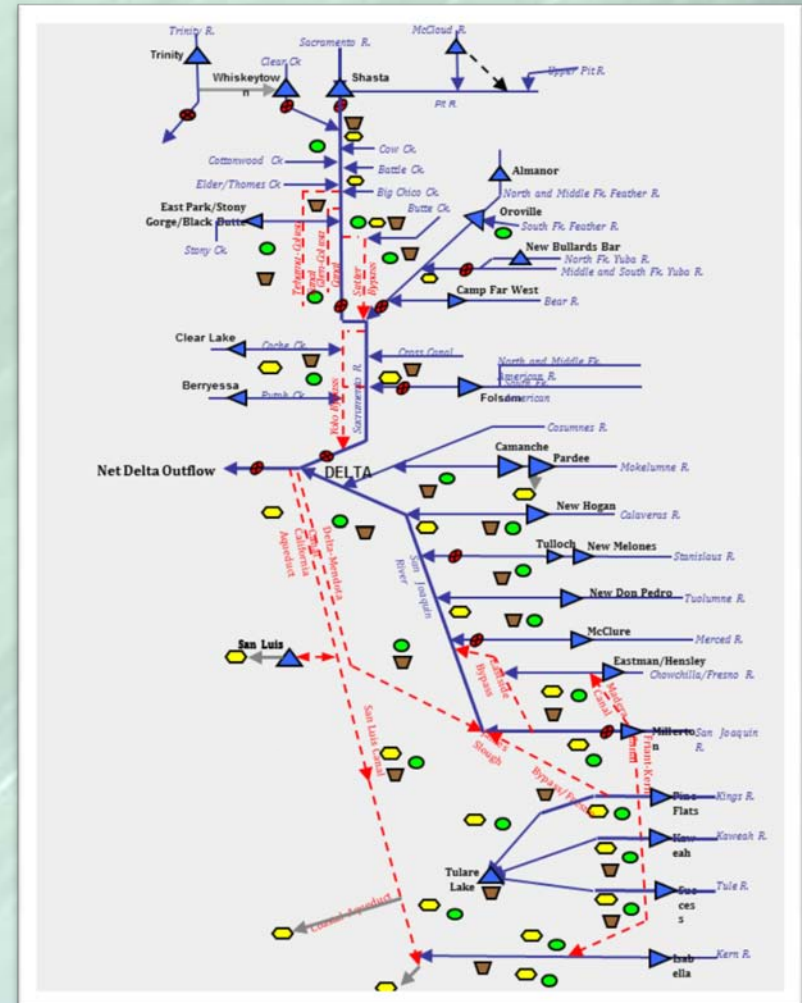


Water Evaluation And Planning (WEAP) Model

Integrates Hydrology and Water Management

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 Monthly temperature and precip. drive rainfall/runoff model
- 💧 Indoor demands:
 - Households / employees
- 💧 Irrigation demands:
 - monthly climate
 - land use patterns
- 💧 Network of rivers, reservoirs, conveyance, groundwater basins
- 💧 Linear program routes supplies to demand nodes according to supply preferences and priorities



Currently Evaluating Four Stylistic Response Packages

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

Management Strategy	Urban Water Use Efficiency	Agricultural Water Use Efficiency	Conjunctive Water Management	Recycled Water Use
Baseline	0% Decrease in Urban Demand	0% Decrease in Agricultural Demand	None	No additional water recycling
Current Commitment	20%	0%	None	10%
Moderate Efficiency	30%	8%	None	10%
Aggressive Efficiency, Conjunctive Use, and Recycling	35%	12%	Broad development of conjunctive use	50%



Performance of Management

Initial Metrics for Pilot

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

💧 Average annual unmet urban water demand

- Sum of indoor and outdoor demand
- Totaled across all planning areas

💧 Average annual unmet agricultural water demand

- Totaled across all planning areas

💧 Environmental performance

- Six in-stream flow requirements (IFRs) captured monthly
- Percentage of missed monthly targets across all IFRs and years



Areas Outside of Central Valley

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 Apply simpler Hydrologic Region model developed for Update 2009
- 💧 Quantify regional water demand
 - 3 growth scenarios
 - 12 climate scenarios
- 💧 Ability to include some demand management strategies
- 💧 Limited ability to quantify most water management responses



Schedule

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

- 💧 May 2011 - SWAN workshop on pilot results
- 💧 May 19 – advisory committee meeting
- 💧 Summer 2011 – regional outreach
- 💧 Fall/Winter 2011/2012 – Implement proof of concept
- 💧 2012 – Scenario refinement and outreach
- 💧 2013 – Complete Scenarios



Contact Information

- 💧 Vision
- 💧 Update 2009
- 💧 Update 2013 proposal

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💧 SWAN

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